perature, near the melting point of the alloy, so that it is "burnt," a number of blowholes, looking like bubbles of gas, make their appearance (see Fig. 4, which represents commercial brass, containing 30 per cent. of zinc, after it has been annealed at 820°). As the temperature rises, these blowholes increase in number, and at the same time fissures develop round the crystals and eventually form a complete network. It appears that an alloy, not easily fusible, forms round the crystals, and, becoming liquefied, rounds off and corrodes them, thus giving the appearance of fissures. These effects are more readily produced if traces of lead and tin are present, as is usually the case in commercial brass, and the network round the crystals doubtless contains these metals. Under these circumstances the test pieces are of little tensile strength, and are not malleable.

M. Charpy prepares the alloys for examination with the microscope by etching the polished surface by electrolytic attack He points out that the fracture is useless as a guide to the mechanical properties of any metal or alloy. It has usually been supposed, owing to the appearance of the fracture, that a highly crystalline metal is necessarily fragile ; but this is far from being the case. Brass may be mainly composed of crystals as much as one millimetre in diameter without any interstitial matter, and yet may have an elongation of 60 per cent. The only deduction that can be drawn from the appearance of the fracture is that if the crystalline structure is revealed in this way, the metal is brittle and of little tensile strength.

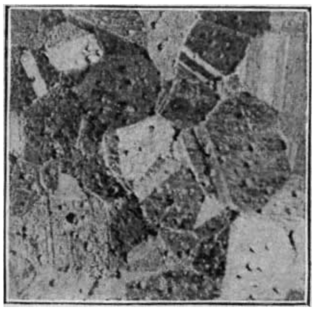

Fig. 4.—Commercial brass, containing traces of lead and tin, "burnt" by being annealed at 820°.

The microscopic structure revealed by etching polished surfaces enables the alloys of copper and zinc to be divided into three classes—those containing less than 35 per cent. of zinc, those containing from 35 to 45 per cent. of zinc, and those containing more than 45 per cent. of zinc. It enables the observer to determine whether the metal has been cast, and, according to the size of the grain, whether the casting has been made at a high or a low temperature, and what is the nature of the mould. It shows the effects of hardening, of annealing at various temperatures, and, lastly, shows whether or not the metal has been burnt.

M. Charpy infers, from the identical appearance of the alloys containing less than 35 per cent. of zinc, that these all consist of isomorphous mixtures of copper with the compound Cu_2Zn, which contains about 66 per cent. of copper. He also confirms the existence of the compound $CuZn_2$ containing 67·2 per cent. of zinc, which forms a perfectly homogeneous alloy under all conditions, and finds that if more zinc than this is present, it remains in the free state soluble in potash. On the other hand, M. Charpy expresses no opinion as to the form in which the metals are present in the alloys containing more than 34 and less than 67 per cent. of zinc. T. K. Rose.

DR. BENJAMIN APTHORP GOULD.

Another busy life, devoted to the advancement of astronomy, is ended by the death of Dr. B. A. Gould. Practically, half a century has passed since his name came prominently before the public, in connection with the establishment of an astronomical journal in America, and throughout this period he has maintained a foremost place in the ranks of American astronomers by the unwearying energy he has exhibited, and the mass of work he has accomplished. For many years he was attached to the United States Coast Survey, where, under Superintendents Bache and Peirce, he did good service in the determination of longitudes at stations along the Atlantic seaboard, from New Orleans to the extreme north-eastern boundary of the United States. In those early days the employment of the method of telegraphic signals had not long been in use in America, and was scarcely known in Europe, and its subsequent development for longitude investigations owes much to the energy that Dr. Gould brought to bear upon problems of this character. When the Atlantic cable was successfully laid, he perceived the advantages it offered to connect the American with the European longitudes, and thus to practically reduce the two independent series of determinations into one complete system.

It was while engaged on the staff of the Coast Survey, and anxious in every way to promote its interests, that he became unfortunately embroiled with the Trustees of the Dudley Observatory. It is not necessary to make any further allusion to this unhappy affair, beyond expressing our belief that Dr. Gould was a much-injured and much-persecuted man. Conducting, as he was at the time, an American journal of high repute, and fully employed on the affairs of the Coast Survey, he probably was ill-advised to attempt to direct the Dudley Observatory, by giving to the institution the leisure that his other occupations permitted. But if he erred in judgment he suffered severely. That there is abundant evidence to show ; but that his reputation rose above the attacks of his persecutors, is a matter for congratulation. The Dudley fiasco came about in 1859, and in the next year Abraham Lincoln was elected to the Presidency, the war of Secession was imminent, and with the troubles that supervened, the *Astronomical Journal* was suspended. Not that Dr. Gould's industry was less. A glance at the Royal Society's catalogue of papers shows a long list attached to his name, and some of them, such as the reduction of D'Agelet's observation, involved considerable labour. It is possible here, however, only to refer to his best-known work, the successful establishment of an observatory at Cordova, and the great amount of work therein accomplished. The observatory itself is the outcome of a private expedition that Dr. Gould planned to the Argentine Republic, in order to extend to the southern hemisphere the system of zone observations that Bessel and Argelander had applied to the north. This private expedition was welcomed and adopted by the Argentine nation, and led to the foundation of that national observatory under whose auspices those valuable and extensive catalogues have been published, and whose preparation kept Dr. Gould at Cordova some fourteen years. While waiting for the full instrumental equipment of the observatory, Dr. Gould and his assistants occupied themselves with the preparation of charts of the southern hemisphere, giving the position of those stars that could be seen with the naked eye, and assigning to them magnitudes, which practically extended Argelander's scale to the whole heavens. For this work he was awarded the Gold Medal of the Royal Astronomical Society ; he had been elected a foreign associate in 1855.

Dr. Gould on leaving South America returned to Boston. Here, in 1886, after an interruption of twenty-

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five years, the *Astronomical Journal* again made its appearance under his editorship, and seems likely to have a long and prosperous career.

Although Dr. Gould's reputation as an astronomer will probably rest on the manner in which he carried to a successful issue long, and even wearisome, undertakings, involving continual repetitions of the same processes (witness the Cordova Zone Catalogue and the long series of longitude determinations), it must be admitted that he was keen to recognise the merits of new developments. He must be regarded as one of the first, if not *the* first, to foresee the practical advantages of the application of photography to the accurate determination of star places. So far back as 1866, he had co-operated with Mr. Rutherfurd in photographing the Pleiades, and had deduced the positions of some fifty stars in this group, clearly demonstrating the smallness of the average error of measurement, and the possibility of using those measurements in cosmical inquiries. Later he measured the relative coordinates of the stars in the Præsepe cluster, and the plan of operations proposed for the conduct of the Cordova observatory orginally contemplated the employment of photographic apparatus. The disappointment that Dr. Gould suffered on finding the object-glass broken on its arrival at Cordova is a matter of history, and his heroic attempts to repair the mischief show how fully he appreciated this line of investigation and his eagerness to promote it. W. E. P.

NOTES.

WE referred last week to a very unworthy insinuation, contained in a leading article in the *Times*, that Lord Rayleigh had retired from the Council of the Royal Society owing to a want of sympathy with, or a want of respect for, his colleagues. Lord Rayleigh has since sent the following letter to the *Times*.

"Sir,—In your issue of Tuesday, after some too flattering remarks regarding my tenure of office, you say that I have taken the unusual step of declining to sit on the Council, and that no one who knows the play of forces within the Society can doubt that my refusal is significant. There seems to be here a suggestion that my retirement is due to a difference with my colleagues —colleagues with whom I have worked for eleven years in complete harmony, and for whom I retain the highest regard.

Permit me to say that my retirement is significant only of a desire to escape engagements involving journeys to London, and of a possibly mistaken impression that the position of an ex-Secretary as an unofficial member of Council would be a little anomalous. "I am, Sir, yours faithfully,

"Dublin, December 2." "RAYLEIGH.

THE Davy-Faraday Research Laboratory of the Royal Institution, founded by Dr. Ludwig Mond, F.R.S., will be opened by the Prince of Wales on Tuesday afternoon, December 22.

THE first instalment of the Austin Corbin herd of buffalo, twenty-five in number, has just been removed from the Corbin Estate, in New Hampshire, to Van Cortlandt Park in New York City.

THE eleventh German Geographical Congress will be held at Jena on April 21, 22, and 23. The papers and discussions will principally refer to polar investigations, physical geography, biological geography, the topography and natural history of Thuringia, and the teaching of geography in schools.

THE death is announced of Dr. Karl Sebastian Cornelius, the author of many works on physics and physical geography, and privat-docent, with the title of Professor, in the University of Halle. We also notice the death of the zoologist, Dr. Fritz Westhoff, of the Königl. Akademie at Münster.

MR. P. F. COOK sailed for Hamburg a few days ago in the interests of the American Colonisation Society and of the Smithsonian Institution. He will remain a month at the Hague, studying myriapods and insects, and will then proceed to Siberia for a residence of several months, to conduct investigations of scientific and economic matters.

THE Liverpool Chamber of Commerce has unanimously adopted a resolution in favour of the adoption of the metric system of weights and measures, and urging that at the earliest possible moment consistent with the public convenience a Bill should be brought in to make the system compulsory.

DR. BERNARD DYER has been elected President of the Society of Public Analysts for the year 1897. The newly-nominated Hon. Secretaries are Mr. E. J. Bevan and Mr. Charles E. Cassal.

WITH reference to our note of November 19 (p. 58), on the "Welby Prize," we are requested to announce that, in consequence of unforeseen delays, it is found desirable to extend the time allowed to competitors till January 1, 1898, and that Prof. Émile Boirac, Paris, becomes the French member of the Committee of Award.

AFTER an absence of three years, the expedition under Lieut. Hourst has safely returned to Europe from the Niger. The party ascended the Senegal River, and then carried the section of an aluminium boat overland to the upper part of the Niger. On reaching this river the pieces of the boat were put together, and two native boats purchased. In these the expedition sailed down the Niger to Timbuctoo, where a stay of ten months was made. The voyage from Timbuctoo to Lokoja, at the confluence of the Niger and Benue, seems to have been arduous, but from that point the expedition was towed by a launch belonging to the Royal Niger Company to the coast at Wari. How much fresh topographical information Lieut. Hourst's party has obtained is not yet stated; this will depend on the highest point reached on the Niger. Reuter's message states that the expedition "first met the river Niger at Kayes"; but that town is on the Senegal River. There can be no doubt, however, that much valuable scientific information was obtained, for the expedition travelled slowly, and was admirably equipped. One novelty was the use of a phonograph for reporting the native war songs. The expedition kept peace with the natives throughout the journey, in which it differs greatly from some of those previously conducted by French explorers in that region.

THE success which has attended the installation of a meteorological observatory on the summit of Mont Blanc has (says the *Daily Chronicle*) stimulated Italian men of science to crown Monte Rosa with a similar edifice. Queen Margherita, herself an expert mountaineer, supports the project by a donation of 160*l*., the Duke of the Abruzzi gives 200*l*., and the Italian Alpine Club, the Ministers in their private capacity, and the physical faculty of the University of Turin figure among its chief contributors. It is intended to utilise the hut on the Gniffetti peak, built three years ago as a shelter for climbers. Situated at a height of about 14,000 feet above sea-level, the observatory will, as regards elevation, rank fourth among the twenty-seven mountain observatories of the world, being surpassed in altitude only by those of Arequipa, Mont Blanc, and Pike's Peak.

IN 1897, for the first time since the British Medical Association came into existence, the annual meeting will be held outside the British Isles. In order to induce as many members of the Association as possible to decide to go to Canada next year, the *British Medical Journal* prints an illustrated article in the current number, showing the extensive preparations already co-

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